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a tool for building up the business strategy

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Skallerup Klit's carbon footprint - a tool for building up the business strategy

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Abstract Skallerup Klit is a Danish holiday center certified as CO_2 neutral. They use this label for branding as them selves as the first CO_2 neutral holiday center in Denmark. There are reasons to question how ambitious "CO_2 neutrality" as a strategy is, because this goal can be reached rather easily by offsetting and without making actual emission reductions. Therefore the purpose of this study is to present recommendations on how Skallerup Klit can build up their business strategy using Carbon Footprint (CFP) as a tool. The CPF is calculated and assessed by using financial data in an Input-output LCA. For the LCA the system boundaries of the assessment of Skallerup Klit´s CFP are defined to include both direct and indirect emissions from the supply chain and from transportation and food eaten at the holiday center. Scenarios are conducted to illustrate where the greatest emission reductions are possible and the results are then used to make recommendations on how Skallerup Klit can build up their business strategy on future CO_2 reduction initiatives.

1 Introduction

Tourism accounts for a large share of global CO_2 emissions due to transportation, accommodation and related activities [1]. As a result of increasing environmental awareness and possible new business opportunities, companies in the tourism sector are beginning to address the environmental impacts and climate change challenge by actively using different kinds of tools such as environmental management systems and eco-labels [2]. Another tool for assessing a

company's environmental performance and developing a more proactive strategy could be through life cycle assessment. With a specific focus on assessing climate change from a life cycle perspective, Carbon Footprint (CFP) can be used in a company strategy to keep accounts of environmental improvements over time, or to compare different products or services in order to support decision making [3].

Skallerup Klit, one of Denmark's five largest holiday centers attracting 240,000 visitors every year, is selected as a case study. The holiday center is located at the northwestern coast of Denmark offering a "carbon neutral holiday" [4]. Since 2003 Skallerup Klit has continuously improved their environmental management with a focus on energy consumption. Throughout these years, the tourism center has achieved ISO 16064-1 certification and implemented the quality management system DS 2403. In August 2010, by purchasing hydro power and installation of renewable energy for heat Skallerup Klit has reached their goal of neutralizing their CO_2 emissions and acquired certification as CO_2 neutral [6]. Their carbon neutrality is used for branding by creating an environmental profile for the customers, and offering the visitors what they call a carbon neutral holiday.

Based on the case of Skallerup Klit, the objective in this study is to find out how CFP in a life cycle perspective can further improve their environmental performance, and how the CFP can be used as a tool to obtain an assessment of Skallerup Klit´s contribution to global warming with a wider approach including not only the energy consumption of the center, but the whole life cycle of the entire holiday offered by the company.

2 Research methodology

2.1 Methods for identifying and analyzing Skallerup Klit´s climate and business strategy

In order to achieve knowledge and understanding of the organizational aspects, the visions and policy regarding climate change, and strategy of the company and the management, qualitative methods have been used. The chosen methods are discourse analysis, interviews, and study of the company´s documents.

2.2 Method for assessing Skallerup Klit´s CO_2 emissions

CFP is the total amount of GHG emissions from a product or service during its whole life cycle measured in term of CO_2 equivalent [6; 7]. To obtain the CFP results, LCA framework based on ISO standards [8; 9] is applied in the assessment. The assessment includes all inputs (energy, materials, land use and water) and outputs (emissions) from activities related to the operation of Skallerup Klit as illustrated in fig.1.

The functional unit of this CFP is the annual operation of the company, Skallerup Klit, in year 2009. Hybrid LCA based on input-output and process-based database and consequential modelling is applied in order to present the more complete CFP results including service activities such as administration and marketing. The system boundaries comprise transportation, electricity, food, administration and marketing (fig. 1). As a tool for conducting the LCA the program SimaPro 7.2 has been used.

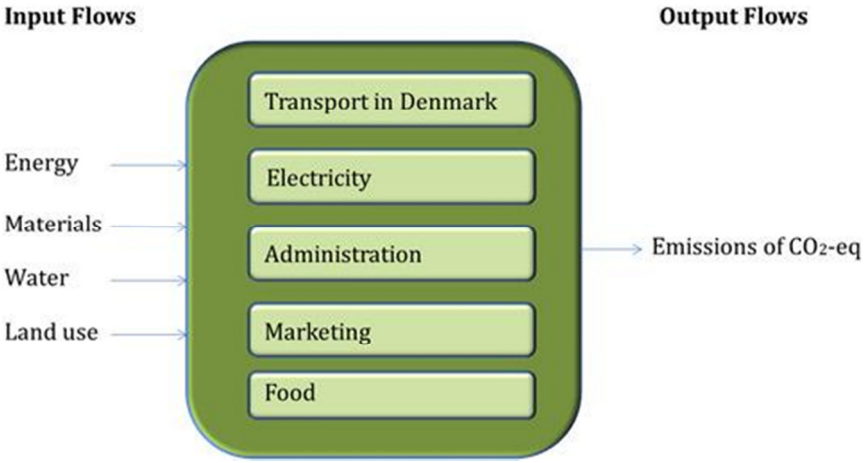

Fig. 1: System boundaries for the calculation of the CFP for the operation of Skallerup Klit 2009 [adapted from 10]

The data for CFP calculation is obtained from Skallerup Klit's financial report representing the annual cost of running the center in 2009 and EU&DK Input Output database [11] supplemented with scientific literature.

Three different scenarios (focusing on transportation, energy and food) have been developed on the basis of customer analyses (carried out by Jysk Analyse, a Danish opinion-research agency) as improvement options for Skallerup Klit to reduce its CFP.

3 Business strategies in relation to CO_2 neutrality

3.1 Organization's structure

Skallerup Klit is an independent organisation built up around the line-staff principle, where authority is centralized. This means, decisions are made from the top and then runs through the organization by a layer of middle managers, etc. in the various lines in the company [9]. Such structure can have constrains in relation to employee participation and motivation regarding environmental and climate management.

3.2 Visions

According to the interview with Skallerup Klit's CEO, Niels Bro, the main vision of Skallerup Klit is an optimization of the energy consumption. He mentioned that the CO_2 neutrality strategy not only concerns environmental accountability, but is also an attempt to be ahead of time and customer demands [13].

3.3 Policy, objectives and targets

Skallerup Klit's policy is based on a combined strategy for the technical management of energy, climate efforts and security-quality (SKS-system). This management system is made according to the national standards of energy management DS 2403:2008 and the International Standard of Greenhouse Gasses, part 1, ISO 14064. Following the requirements of these standards made the certification of being CO_2 neutral possible in 2010. Skallerup Klit´s objective is to be 100% self sufficient with energy and to offer a carbon neutral holiday [14]. The overall aim has been to make Skallerup Klit CO2-neutal before COP15 in 2009 [13]. As mentioned earlier Skallerup Klit achieved this goal and was certified in 2010 by Det Norske Veritas.

3.3.3 Toward CO_2 neutrality?

Skallerup Klit has used different initiatives and strategies to achieve their vision to be CO_2 neutral. Thus, Skallerup Klit has installed different energy systems based on renewable sources, such as geothermal heat (22%), solar panels (1%), and wood pellet furnace (25%). Furthermore, Skallerup Klit receives electricity from a Danish hydropower plant (48%) [15].

To calculate their CO_2 emissions, Skallerup Klit has followed the criteria listed in ISO 14064-1 and included direct emissions and indirect emissions from electricity consumption [16]. According to their calculation, Skallerup Klit´s total emissions are 2,475.4 tons GHG per year and after subtraction of land, which absorbs GHG,

their total emissions are estimated to 1,996 tons. To neutralize this Skallerup Klit has signed an agreement about Origin Guarantees concerning renewable energy from the Danish hydro power plant Tangeværket [17]. Based on this calculation, Det Norske Veritas has verified Skallerup Klit´s GHG emissions and substitutions.

4 Skallerup Klit's carbon footprint and reduction scenarios

4.1 Carbon footprint with a life cycle perspective

Skallerup Klit's CFP in this study includes both direct and indirect emissions based on the company's financial report and IO database. Hence, it can better represent the actual emissions compared with the business-as-usual CFP with a focus on the company's border and energy consumption. Apart from the IO database, emissions from transportation and food are separately estimated as described below.

4.1.1 Emissions from transportation

The transportation contributing to Skallerup Klit's CFP can be divided into the following categories:

- Transportation within the center area: Annually the use of cars emits 20.6 tons CO_2, which accounts for almost a fifth of emissions at Skallerup Klit [16].
- Transportation of employees between home and center: Skallerup Klit averagely has 62 employees, who travel to and from work every working day (assumingly 200 days a year and 12 km per trip).
- Transportation of visitors between home and center: Danish guests travel mainly by car, Norwegian guests (14 %) are arriving by ferry, and Swedish guests arrive by ferry at Frederikshavn or by airplane in Aalborg. During their stay at Skallerup Klit many guests chose to visit other tourist attractions in North Jutland. It is argued that these emissions should be accounted for as well when offering a carbon neutral holiday, since the transportation and trips are a part of a holiday. An assumption is made that 95 % travels by car and 5 % by public transportation (with an assumption, that each car contains

three people and has an average emission factor of 163 g CO_2 pr. km) [18].

- Transportation of goods is necessary and inevitable, but data on the km driven are not available.

  As a result, the transportation associated with holidays at Skallerup Klit contributes to the total CO_2 emissions of 4,765.2 tons annually.

4.1.2 Emissions from food

Having inconsistent data on food the average emissions from the daily foods and beverage consumption of an adult Dane was estimated to be 6 kg CO_2 [19]. Using this factor and number of nights spent at Skallerup Klit (350.000) emissions related to food eaten during a holiday was calculated to 2100 tons CO_2 annually.

4.2 Scenarios for CFP reduction

4.2.1 Scenario 0 – the reference scenario

The scenario 0 presents the current CFP of Skallerup Klit and works as a reference scenario from which the other scenarios will be developed. The CFP is 13,974 tons of CO_2-eq. This is more than five times the emissions reported by Skallerup Klit in their own audit of 2009 (2,475.4 tons of CO_2 [17]). In this calculation, the affected energy supply was identified. The electricity consumption from the origin guarantee of Tangeværket bought by Skallerup Klit does not lead to additional installation. As a result, there will not be actual emission reduction. Furthermore, electricity from Tangeværket is already fully utilized and constrained. The change in demand for electricity will not actually affect the constrained supplier [20]. For this case the affected supplier was determined as the average electricity of Danish grid instead of the constrained hydro power. The hot spots i.e. the areas contributing relatively mostly to the CO_2 emissions are energy consumption (32 %), transportation (34 %) and food (15 %).

4.2.2 Scenario 1 – reductions in emissions from energy

In scenario 1, the energy supply from the origin-guaranteed hydro power without actual installation is substituted with additional wind power. This scenario is partly based on a wish of the management to raise a wind mill for supplying energy to the holiday center towards the strategy of independence from fossil fuels. In the calculations the installation of a windmill was assumed to generate 5204 MWh electricity annually, this being equal to the centers annual electricity consumption. Thus, emissions from electricity were reduced by 100%, giving a total emission reduction of 32%.

4.2.3 Scenario 2 – reductions in emissions from transportation

According to scenario 0 the emissions from transportation (within Denmark) account for 34% of all emissions related to the operation of the center. Skallerup Klit cannot change the fact that guests have to travel to and from the holiday center, but it could be argued that they take a share in the responsibility of addressing these emissions. A range of reduction in km driven from different groups of travelers is chosen to be between 20% and a more optimistic 50%. Thus, the scenario with 20% reduction in transportation gives a total reduction of 912 tons of CO_2. This is a 6.5% reduction of the total emissions from a holiday at Skallerup Klit, and 19% of the emissions from transportation. Reducing emissions with 5% gives a total reduction of 2280.65 tons of CO_2. This is a 16% reduction of the total emissions from a holiday, and 48% of the emissions from transportation.

4.2.4 Scenario 3 - reductions in emissions from food

The food eaten in relation to the holidays taken at Skallerup Klit account for 15% of the total emissions. It is chosen not to make calculations for scenario 3 with reductions in the emissions, because of great uncertainties regarding what amount of food should be vegetarian and locally produced.

4.3 Skallerup Klit´s CFP in comparison to other hotels

The CFP of Skallerup Klit can be divided by the number of nights sold annually (350,000). This would change the functional unit to the operation of Skallerup Klit per guest per night in 2009. This gives a CFP of 40 kg CO_2-eq. In general, the CO_2 emissions per night per bed range from 4.0 to 20.6 kg [1]. For example, Scandic Hotels presents a CFP of as low as 3.6 kg CO_2-eq. per night per guest, but this does not include the guests´ travel to the hotel [21]. To make a meaningful and reliable comparison of CFPs from different hotels, a common shared approach for calculations should be agreed upon. A suggestion is for UNWTO to be responsible for making guidelines for this purpose [21].

5 Recommendations

The hot spots have been identified as energy consumption, transportation and food. Environmental management should be an iterative process with continuous improvements, and therefore investigate options for improvements within all the chosen categories.

5.1 Recommendations on CFP reduction

With respect to energy consumption, Skallerup Klit can reduce their emissions by installing and connecting additional renewable energy to the electrical grid in the form of windmills based on the results of the scenario 1 and 2. By installing windmills in Hjørring Municipality Skallerup Klit will have a larger electricity production, due to the wind potential, than if they were placed e.g. in the middle of Jutland.

For transportation, reductions in the guests´ and employees´ travels in car contribute only 5% – 14% reductions in the total emission (see the scenario 2). Another possibility could be to provide the service of shuttle busses or electric shuttle buses between Skallerup Klit and the destinations most frequently visited by guests and employees. Collaboration with other tourism destinations in North Jutland could

enhance the efficiency of a shuttle bus service, and give the side benefit of marketing.

To reduce CFP from food consumption, suggested alternatives are 1) an introduction of a more vegetable based diet because of the emission intensity of animal products, 2) the purchase of local and seasonal food, because of the minimization of emissions from transportation, storage and refrigeration [22].

Regarding administration, marketing and others, it is not the hot spot in this assessment. These categories are related to the daily management and running of the center. Improvements in these categories would therefore rely on the participation of the employees carrying out the daily work routines. This emphasizes the importance of education and participation of all employees in all departments.

5.2 Stakeholder collaboration

The discourse that we all have a responsibility to reduce CO_2 emission is created in the communication between Skallerup Klit and its stakeholders.

5.2.1 The Region of North Jutland and governments

Other tourist destinations in North Jutland could be facing similar challenges as Skallerup Klit when it comes to mitigating climate change, and thus collaboration in a public-private-partnership between tourist destinations and the regional authority (Region North Denmark) could help optimize the development of solutions. Partners for the development of CO_2 reducing transportation could be other tourism destinations, the Region, local municipalities, DSB (Danish rail), NT (public transport company, bus) and Visit North Jutland. Moreover, Hjørring Municipality is an essential stakeholder for Skallerup Klit because of their conclusive saying in the windmill project. More specifically they want to promote renewable energy solutions and reduce transportation by providing good infrastructure.

Thus, it is important to Skallerup Klit to negotiate continually with Hjørring Municipality and prove the necessity of windmills installation.

5.2.2 Network

Regarding the introduction of the principles of sustainable food, locally produced food could be developed through a network with the municipality and food producing and retailing businesses in the area. A local network is needed to develop initiatives successfully, and to share the companies´ experiences and affect stakeholders.

6 Conclusions

Skallerup Klit has for some years worked with improvements of their energy solutions. This has reduced their CO_2 emissions substantially and recently they have chosen to use the climate focus more actively in their branding. To increase credibility they have chosen to get certified by Det Norske Veritas as being CO_2 neutral. CFP can be used firstly as a tool to illustrate which areas in the operation of the company are contributing most significantly to global warming. Here the electricity consumption and transportation are proven to be the largest hot spots accounting for 32% and 34% respectively, and emissions from the consumption of food is the third largest hot spot accounting for 15%. By substituting the current energy solution with new installations of wind power, Skallerup Klit would add additional renewable energy to the grid and thereby reduce their total emissions from the holidays. Further a windmill could serve as a symbol of their environmental awareness and thus create positive reputation among their stakeholders.

In order to promote a less energy intensive transportation Skallerup Klit could provide shuttle busses to Hjørring and Hirtshals where guests arrive by train and ferry and arrange daily bus tours to the most frequently visited sites in the area, as well as bikes for shorter trips.

Concerning emission reduction from food our recommendations is to offer organic, vegetarian and locally produced food. Common to both transportation and food is that to fully utilize the potential in the recommendations presented, collaboration with stakeholders such as Region North Denmark, other tourism destinations, traffic companies and local food producers and farmers will increase the possibility to be innovative and to make the best solutions for the common interest of all.

7 References

[1] Gossling, S., Peeters, P., Ceron, J., Dubois, G., Patterson, T. and Richardson, R. The eco-efficiency of tourism. *Ecological Economics*. 2005. Vol. 54, p. 417-434.

[2] Sprengel, D. C. and Busch, T. Stakeholder Engagement and Environmental Strategy – the Case of Climate Change. *Business Strategy and the Environment*. 2010. DOI: 10.1002/bse.684

[3] Weidema, B. P., Thrane, M., Christensen, P., Schmidt, J. H. and Løkke, S.. *Carbon Footprint. A Catalyst for Life Cycle Assessment?* Journal of Industrial Ecology. 2008. Vol. 12. Issue 1, p 3 – 6.

[4] Skallerup Klit. Financial Report. 2009

[5] Lokal Energi (no date). *Om Lokal Energi*. Available from http://www.lokalenergi.dk/Om_Lokalenergi/Koncept.aspx (Accessed 12.11.2010)

[6] European Commission. 2008. Study for the EU Ecolabel Carbon Footprint measurement toolkit. Background manual. 10 November 2008. Available from http://ec.europa.eu/ecolabel/carbon_en.htm (Accessed 05.04.2111).

[7] Parliamentary Office of Science and Technology (2006), Carbon footprint of electricity generation. POST note 268. October 2006. Available from http://www.parliament.uk/documents/upload/postpn268.pdf (Accessed 05.04.2111).

[8] ISO 14040 (2006), Environmental management - Life cycle assessment – Principles and framework. International Standard Organization (ISO), Geneva

[9] ISO 14044 (2006), Environmental management - Life cycle assessment – Requirements and guidelines. International Standard Organization (ISO), Geneva

[10] Schmidt, J. H. and Thrane, M.. Life cycle assessment. (In Kørnøv, L., Thrane, M., Remmen, A. & Lund H. (eds.). *Tools for Sustainable Development.* Aalborg: Narayana Press. 2007

[11] Schmidt J. H. 2010a. *Documentation of the data consolidation, calibration, and scenario parameterization* from http://forwast.brgm.fr/

[12] Skallerup Klit. 60 år i den yderste klit. Jubilæumsbog 2009. Available from http://www.e-pages.dk/skallerupklit/13/13 (accessed 16.12.2010)

[13] Bro, N. (2010), Interview with Skallerup Klit's CEO, 12 October 2010.

[14]. Skallerup Klit. Skallerup Klit er først i Danmark med CO2-neutrale ferieophold. Pressemeddelelse. Available from http://www.skallerup.dk/pdf/energipolitik/presse.pdf.

[15] http://www.skallerup.dk (accessed 01.11.2010)

[16] (Skallerup Klit, Ferie i klimabalance. Skallerup Klit – CO_2 neutral ferie. 2009

[17] Skallerup Klit. Rapport vedrørende udledning af drivhusgasser 2009. 2010

[18] MST. *Krav til CO_2 fra biler*. Danish Ministry of the Environment. Environmental protection Agency. 2010. Available from http://www.mst.dk/Virksomhed_og_myndighed/Miljoeindsats_paa_tvaers/Transport/CO2+udslip+fra+biler/ (Accessed 27.11.2010)

[19] Hermansen, J. E. and Olesen J. E,. *Landbrugets og fødevareforbrugets klimapåvirkning* In: Klimanet, 16th year nr. 4, November 2009. Available on http://130.226.173.223/klimanet/documents/VJ409_artikel%205_s137_140.pdf

[20] Weidema B P, Ekvall T, Heijungs R (2009), Guildelines for applications of deepened and broadened LCA. Deliverable D18 of work package 5 of the CALCAS project. Consequential LCA. Accessed 20100808, http://www.lca-net.com/files/consequential_LCA_CALCAS_final.pdf.

[21] Dodson, S. *Nordic hotel chain cuts carbon footprint by a third* In: Guardian.co.uk 31.08.07. Available from http://www.guardian.co.uk/travel/2007/aug/31/travelnews.hotels1 (Accessed 02.12.2010)

[22] Sustainweb. 2010. Available from http://www.sustainweb.org/ (Accessed 12.12.2010)